

Claims

[c1] What is claimed is:

1. A method to improve the efficiency of a phacoemulsification system by delivering a burst of ultrasonic power synchronized with a fraction of a low frequency motion waveform at a phacoemulsification needle tip, the method comprising:

selecting an ultrasonic electro-mechanic actuator to axially oscillate a phacoemulsifier needle at ultrasonic frequency;

selecting a low frequency electro-mechanic actuator to axially oscillate a phacoemulsifier needle at low frequency;

mechanically combining the ultrasonic electro-mechanic actuator and the low frequency electro-mechanic actuator to obtain an axial phacoemulsification needle displacement pattern corresponding to the combined action of both ultrasonic and low frequency electro-mechanic actuators;

selecting a low frequency driver signal waveform to oscillate the low frequency electro-mechanic actuator;

selecting an ultrasonic driver signal waveform to oscillate the ultrasonic electro-mechanic actuator;

detecting a phase and position signal of the low frequency electro-mechanic actuator to synchronize bursts of ultrasonic actuator activity, in a way that bursts of axial ultrasonic activity of the phacoemulsifier needle are repeatedly produced in synchronization with a fraction of each low frequency electro-mechanic actuator cycle.

- [c2] 2. The fraction of said low frequency electro-mechanic actuator cycle corresponding to the part of the low frequency motion cycle where the phacoemulsification needle is axially moving toward the lens tissue and away from the hand-piece body.